

HOSPITAL AND MEDICAL FACILITIES SERIES
(Under the Hill-Burton Program)

design-
equipment

Hospital Engineer in the Construction Sequence

U.S.
Pub

Reprinted with permission by
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
Public Health Service
From HOSPITALS, Journal of the American Hospital Association,
Vol. 32, No. 15, 74+, August 1, 1958

This material supersedes an unnumbered publication
printed November 1958 under the same title.

PUBLIC HEALTH SERVICE PUBLICATION NO. 930-D-8
1963

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Hospital and Medical Facilities
Architectural and Engineering Branch
Washington 25, D. C.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington 25, D.C. - Price 5 cents

HOSPITAL ENGINEER in the CONSTRUCTION SEQUENCE

by PHILIP DREIFUSS

PLANNING PROGRAMS for hospitals can be varied from entirely new construction of a physical plant to replacement of plumbing fixtures or laying out laboratory facilities by minor remodeling and changes in equipment only. To be of any assistance, the hospital engineer must have certain qualifications, among the most important of which are flexibility in thinking through situations and thorough knowledge of hospital operations, both from the technical and economic standpoint.

Basically, anyone involved in a planning program must understand that certain prerequisites are necessary to attain the desired results. One must always keep in mind that flexibility is essential and that it is usually possible to reach the goal by more than one method.

For example, in planning remodeling, minimum disruption of utility services could result in maximum disruption in some department function, such as housekeeping. In a given situation it may be more desirable to disrupt certain utility services than to allow any disruption of housekeep-

How can a hospital engineer contribute to the programming and planning of a remodeling or construction project? What is his role during the construction period and in the initial operating stage of the new or revived facility? Ability to think through situations and a demonstrated knowledge of over-all hospital objectives will make the engineer a valued member of the planning team during these important periods, the author states.

ing functions. These considerations must be understood by the hospital engineer, who should be one of the dynamic forces in a planning team to assure an orderly sequence of planning.

EARLY PHASES OF PLANNING

In practice, the hospital engineer may seldom be called in to participate in the early phases of planning. The reason may be

the engineer has to the administrator that he has a thorough knowledge of the over-all plant has a desire to be involved in planning and is interested in all phases of the plant and not just the boilers, fans, etc.

Most hospital engineers are familiar with the market and have been countered with the thought to what extent the future operation will keep pace with the market. However, the situation is self-explanatory.

Normally, those involved in a planning program are:

Hospital administrator
Architect
Consulting engineers
Department heads

The sequence of planning usually would be roughly as follows:

Program. This is the first step in planning. The main essentials are that the program should be put in writing so that detailed studies can be made to find whether the finished product or change will accomplish the desired results. Costly interim conferences and changes will be reduced if all concerned understand that one should start a complete program with all details of the new plan been

Philip Dreifuss, P.E., was formerly mechanical engineer in the Hill-Burton Program, Public Health Service Regional Office, Kansas City, Mo. This article is based on a speech given at the American Hospital Association Institute on Hospital Engineering in Kansas City, April 7-11, 1958.

ing systems, air conditioning, wiring, plumbing, construction, etc.

The architect and consulting engineers should meet with the hospital planning group at this stage to discuss the drawings and outline specifications. The hospital engineer should attend this meeting, as his experience should be of value in determining the acceptability of certain aspects of the planning. Plans should be presented to the hospital engineer far enough in advance of the meeting for him to make a detailed study. In planning facilities, the architect and engineers may not always have kept maintenance and operating problems in mind.

Contract Drawings and Specifications. The hospital engineer should be thoroughly familiar with the provisions of these drawings, sometimes called "bidding documents". He should have detailed information as to what is being specified or proposed for assurance that all items can be reasonably maintained and will function under the normal program set up by the hospital.

The hospital engineer should carefully examine all specifications to make sure all equipment can be properly serviced in his area. The designing architect or engineer should be apprised of any difficulties that may be encountered. Adequate records should be kept on the maintenance and operations of existing equipment so that the facts, rather than thoughts or ideas, can be presented.

Once plans and specifications are placed on the market and bids are taken, changes that are necessary due to an oversight can cost a considerable sum of money. This does not mean that changes are not necessary on occasion since, as construction proceeds, new concepts may develop.

CONSTRUCTION PHASE

The degree to which the hospital engineer acts as the owner's representative for addition or alteration projects depends upon his experience and responsibilities. Only if he is specifically appointed as clerk-of-the-works or given a similar title should he have any direct relationship with the contractors. He should keep abreast

of construction, however, and if he notices anything requiring correction, he should make suggestions only through the architect's representative.

Where the hospital is contracting direct for alterations or repair work, the hospital engineer should have the same authority as an architectural representative or clerk-of-the-works. Detailed supervision is indicated under these conditions and usually a direct savings can inure to the hospital if the hospital engineer has sufficient background and experience in the type of work under contract.

During construction, shop drawings are received periodically by the architect, who should consult with the hospital engineer if there are any deviations from equipment specified or shown. This liaison will be difficult to achieve but it is very important if the hospital engineer has the proper background. Due to the complexity of hospital construction, there is always a possibility that layouts or drawings will be misinterpreted. There are also cases in which certain items of equipment are specified but due to size or other characteristics cannot be located in areas originally shown. In these situations, maintenance or operational problems may be created when substitutions or layout revisions are made. The viewpoint of the hospital engineer will be helpful in solving them.

EFFECT OF BUILDING CODES

The complexity of present-day construction and the many new products constantly appearing on the market have made it necessary for local and state governments to establish building codes. These codes are primarily minimum standards to protect the health, safety and welfare of the public. In many instances they are used as a guide in construction. Some are performance codes and others are specification codes.

The following codes should be available to the hospital engineer, and he should understand how they affect his day-to-day operations and any future planning:

Building
Building exits
Heating, ventilating, and air conditioning

Plumbing
Electrical
Elevator
Smoke abatement
Zoning restrictions and ordinances
Boilers
Pressure vessels

UTILITIES DATA USEFUL

Knowledge of local utility services and rates is essential to a comprehensive background of the economics of hospital operation. For example, the hospital engineer should know the Btu rating per cubic foot of gas (if it is the primary fuel of the hospital) and the quantities that will be consumed, so that preferential rates may be obtained. The same should be true of oil, including the quantity that must be purchased in order to obtain reduced rates. In many instances, the hospital engineer is in a better position to obtain this information than the designing architect or his consulting engineer. In general, the hospital engineer should have the following information available:

Water. Pressure, fluctuations in pressure from maximum to minimum, flow rates and conditions of mains, and sizes of mains. He should know approximately which mains and laterals serve the hospital.

Sewage Lines. Location and size of drain lines, capacity of lines, any backwater problems when storm and sanitary are carried in the same lines, knowledge of separated systems within the community, necessity for grease traps, and the local policy for handling of radioactive materials if there are any.

Electrical. Types of service available, rates, dependability.

Heating Fuels. Dependability of supply, rates, operational problems.

It should be remembered that changes in the plant can affect the utilities and conversely, any changes in utility characteristics can affect existing equipment.

The hospital engineer's knowledge of local labor union policies will also be useful in planning new or remodeled facilities. Variations in rules covering what a union will allow its members to do should be known by the hospital engineer so

that he can make use of the situation rather than allow it to become an operational bottleneck in equipping and planning. For example, boilers can be designed to operate at variations in pressure so as to allow use by different classes of engineers during certain shift periods; light fixtures of the type that must be changed by electricians can be kept at a minimum.

OPERATIONAL PHASE

When the facility is ready to be turned over to the hospital for operation, the engineer comes to the maintenance and operation phase of the project. He now is given the responsibility for caring for an investment of many thousands of dollars. A consultation with the hospital engineer, rather than the designing architect or consulting engineer, in setting up the policies for caring for this investment, will determine to a great degree the life expectancy and usefulness of the building. The engineer should be one of the dynamic forces behind setting up the policies; he must be able to "sell" the programs to other members of the management team.

One reason why the hospital engineer should be thoroughly familiar with the provisions of the contract documents is that certain guarantees and maintenance provisions are included. For example, the building and its parts normally carry a one-year guarantee that they are as specified and will function in a certain manner. The engineer should know the date that this guarantee becomes effective, as it can affect certain mainte-

nance work that he may perform. If during the first year a fault comes to light that indicates a piece of equipment was not as good as specified, he may contact the contractor responsible for the installation and then the architect, apprising him of the situation in case his help should be needed.

A normal guarantee does not provide for replacement or repair if the specified equipment is not properly maintained. Proper maintenance is solely the responsibility of the hospital. For this reason, the maintenance program must be worked out before the engineer assumes the responsibility for the building or equipment.

STANDBY REPLACEMENTS

When the building is accepted from the contractor, the party accepting should make it a point to obtain standby replacements for certain pieces of equipment that may have been ordered especially for the building and may not be manufactured in the same pattern in the future.

These replacement items might include double pane windows, pump spares, extra motors, acoustical tile, floor tile, faucets or other equipment of special design that is critical to the building's operation or maintenance. Most contractors will be very cooperative in assisting the engineer to stockpile such items for, to a degree, it safeguards their guarantee.

The engineer should also make sure that maintenance manuals, parts lists and operating instructions are on file for all equipment. In many instances, the contractor installing a piece of equipment is

not thoroughly familiar with its maintenance and operation requirements. Equipment specifications should include a clause covering maintenance instructions and manuals. The hospital engineer should go over all brochures, manuals and parts lists to make sure they are clear and that they pertain exactly to the equipment installed. This material should be filed in such a way that there will be a minimum of delay in finding the proper operating or maintenance instructions should any failure occur. Any warranties or guarantees on parts not necessarily covered in the specifications (five-year warranties on compressors, for example) should be kept in the same general file as the equipment manuals.

The hospital engineer must impress upon management the necessity for allocating adequate funds for maintaining the hospital building, which must withstand all of the rigors of the elements. It expands and contracts under temperature changes from -40° to 120°F. or more in parts exposed to the sun. Its fans and pumps may have to run 24 hours a day for weeks and even months or years. It must withstand vibrations of automobiles, trucks, and aircraft outside and various activities on the inside. It is sometimes remodeled and at times is strained far beyond the use for which it was designed. It is used and abused by countless thousands of people over the few of whom have any its proper preservation selling job +1 neer mus ing out hi

Hill-Burton Publications

An annotated bibliography, "Hill-Burton Publications," Public Health Service Publication No. 930-G-3, will be provided upon request. For a free single copy, write to:

Division of Hospital and Medical Facilities
Public Health Service
U. S. Department of Health, Education, and Welfare
Washington 25, D.C.

The bibliography presents a brief description of each of the publications from the Hospital and Medical Facilities Series under the Hill-Burton Program. They are listed by category as shown below:

- A -- Regulations
- B -- Community Planning
- C -- Organization and Administration
- D -- Design and Equipment
- E -- Research and Demonstration
- F -- Reports and Analyses
- G -- Bibliography

Publications must be ordered by their complete title and publication number rather than by category.